E1003874 Jan.27.2010

Certificate of UN test for Lithium ion battery

Customer Model : AS10B3E
Sanyo Model : 3UR18650-2-T0627
Sanyo Product Code : F13860785

Manual of Tests and Criteria (38.3 Lithium batteries)		Test results	Note	Number of test batteries			
No.	Test item						
T 1	Altitude simulation	Pass		First cycle fully charged 4 batteries	First cycle fully Discharged 4 batteries	After 50 cycles fully charged 4 batteries	After 50 cycles fully discharged 4 batteries
T 2	Thermal test	Pass					
T 3	Vibration	Pass					
T 4	Shock	Pass					
T 5	External short circuit	Pass					
T 6	Impact	Pass		First cycle 50% charged 5 cells for cylindrical cell, 10 cells for prismatic cell, 5 cells for coin cell.		After 50 cycles,fully discharged 5 cells for cylindrical cell, 10 cells for prismatic cell, 5 cells for coin cell.	
T 7	Overcharge	Pass	For battery only	First cycle fully charged 4 batteries		After 50 cycles,fully charged 4 batteries	
T 8	Forced discharge	—	For cell only	For cell only			

Lithium ion battery Specification

Item	Nominal value	Note
Watt-hour rating	67 Wh	
Nominal voltage	11.1 V	
Lithium equivalent content	5.4 g	

We declare the above : The test result mentioned above was checked according to UN test.
(Manual of Tests and Criteria ST/SG/AC.10/11/Rev.5, PartIII,sub-section 38.3)

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Certificate of Package Drop Test for Lithium ion battery

Customer Model : AS10B3E
Sanyo Model : 3UR18650-2-T0627
Sanyo Product Code : F13860785

Test item	Test results	Note
Package Drop Test	Pass	The package shall be dropped from 1.2meter high onto a concrete surface (flat and horizontal) with five orientations (drop once a sample); (1)flat on the bottom,(2)flat on the top,(3)flat on the long side, (4)flat on the short side, (5)on a corner

Lithium ion battery Specification

Item	Nominal value	Note
Watt-hour rating	67 Wh	
Nominal voltage	11.1 V	
Lithium equivalent content	5.4 g	

We declare the above : The test result mentioned above was checked according to UN test.
(Model Regulations ST/SG/AC. 10/1/Rev.16, Special Provision188)

UN Test Data (Model:3UR18650-2-T0627)

1.Test Item: Altitude simulation (T1)

2.Test Purpose: This test simulates air transport under low-pressure conditions.

3.Test Procedure:

Test cells and batteries shall be stored at a pressure of 11.6kPa or less for at least six hours at ambient temperature(20±5℃).

SANYO Internal Procedure:

As above.

4.Test Requirements:

No mass loss(less than 0.1%),no leakage,no venting,no disassembly,no rupture and no fire,and the voltage retention is not less than 90%.

The requirement relating to voltage is not applicable to test batteries at fully discharged states.

5.Test Date: 2010/1/7

6.Test Data

Battery No.		Mass(g)		Mass loss (%) (=<0.1%)	Voltage(V)		Voltage Retention(%)(=>90%)	Other event	Result	Judgement
		Before test	After test		Before test	After test				
At first cycle,in fully charged states	1	327.73	327.78	0.015	12.95	12.94	99.9	0	PASS	PASS
	2	328.58	328.69	0.033	12.97	12.96	99.9	0	PASS	
	3	328.44	328.46	0.006	12.97	12.97	100.0	0	PASS	
	4	328.30	328.42	0.037	12.95	12.95	100.0	0	PASS	
At first cycle,in fully discharged states	5	327.63	327.42	0.064				0	PASS	
	6	328.29	327.99	0.091					PASS	
	7	328.08	328.10	0.006				0	PASS	
	8	328.15	328.26	0.034				0	PASS	
After 50 cycles ending in fully charged states	9	328.60	328.56	0.012	12.97	12.97	100.0	0	PASS	
	10	328.67	328.67	0.000	12.96	12.96	100.0	0	PASS	
	11	327.57	327.32	0.076	12.97	12.97	100.0	0	PASS	
	12	327.89	328.02	0.040	12.97	12.97	100.0	0	PASS	
After 50 cycles ending in fully discharged states	13	327.33	327.37	0.012				0	PASS	
	14	327.78	328.02	0.073				0	PASS	
	15	328.51	328.65	0.043				0	PASS	
	16	328.31	328.36	0.015				0	PASS	

Notes: L-Leakage, V-Venting, D-Disassembly, R-Rupture, F-Fire,
0-No leakage, no venting, no disassembly, no rupture & no fire

UN Test Data (Model:3UR18650-2-T0627)

1.Test Item: Thermal Test (T2)

2.Test Purpose: This test assesses cell and battery seal integrity and internal electrical connections. The test is conducted using rapid and extreme temperature changes.

3.Test Procedure:

Test cells and batteries are to be stored for at least six hours at a test temperature equal to 75±2℃, followed by storage for at least six hours at a test temperature equal to -40±2℃.The maximum time internal between test temperature extremes is 30 minutes.This procedure is to be repeated 10 times, after which all test cells and batteries are to be stored for 24 hours at ambient temperature (20 ±5℃). For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12 hours.

SANYO Internal Procedure:

As above.

4.Test Requirements:

No mass loss(less than 0.1%),no leakage,no venting,no disassembly,no rupture and no fire,and the voltage retention is not less than 90%.

The requirement relating to voltage is not applicable to test batteries at fully discharged states.

5.Test Date: 2010/1/8-2010/1/14

6.Test Data

Battery No.		Mass(g)		Mass loss (%) (=<0.1%)	Voltage(V)		Voltage Retention(%)(=>90%)	Other event	Result	Judgement
		Before test	After test		Before test	After test				
At first cycle,in fully charged states	1	327.78	327.57	0.064	12.94	12.73	98.4	0	PASS	PASS
	2	328.69	328.50	0.058	12.96	12.70	98.0	0	PASS	
	3	328.46	328.28	0.055	12.97	12.75	98.3	0	PASS	
	4	328.42	328.24	0.055	12.95	12.74	98.4	0	PASS	
At first cycle,in fully discharged states	5	327.42	327.22	0.061				0	PASS	
	6	327.99	328.10	0.034				0	PASS	
	7	328.10	327.92	0.055				0	PASS	
	8	328.26	328.08	0.055				0	PASS	
After 50 cycles ending in fully charged states	9	328.56	328.41	0.046	12.97	12.77	98.5	0	PASS	
	10	328.67	328.49	0.055	12.96	12.79	98.7	0	PASS	
	11	327.32	327.35	0.009	12.97	12.79	98.6	0	PASS	
	12	328.02	327.89	0.040	12.97	12.80	98.7	0	PASS	
After 50 cycles ending in fully discharged states	13	327.37	327.17	0.061				0	PASS	
	14	328.02	327.83	0.058				0	PASS	
	15	328.65	328.67	0.006				0	PASS	
	16	328.36	328.18	0.055				0	PASS	

Notes: L-Leakage, V-Venting, D-Disassembly, R-Rupture, F-Fire,
0-No leakage, no venting, no disassembly, no rupture & no fire

UN Test Data (Model:3UR18650-2-T0627)

1.Test Item: Vibration (T3)

2.Test Purpose: This test simulates vibration during transport.

3.Test Procedure:

Cells and batteries are firmly secured to the platform of the vibration machine without distorting the cells in such a manner as to faithfully transmit the vibration. The vibration shall be a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes.This cycle shall be repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting positions of the cell. One of the directions of vibration must be perpendicular to the terminal face.

The logarithmic frequency sweep is as follows: from 7 Hz a peak acceleration of 1gn is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm(1.6 mm total excursion) and thefrequency increased until a peak acceleration of 8gn occurs (approximately 50Hz).A peak acceleration of 8 gn is then maintained until the frequency is increased to 200Hz.

SANYO Internal Procedure:

As above.

4.Test Requirements:

No mass loss(less than 0.1%),no leakage,no venting,no disassembly,no rupture and no fire,and the voltage retention is not less than 90%.

The requirement relating to voltage is not applicable to test batteries at fully discharged states.

5.Test Date: 2010/1/15-2010/1/18

6.Test Data

Battery No.		Mass(g)		Mass loss (%) (=<0.1%)	Voltage(V)		Voltage Retention(%)(=>90%)	Other event	Result	Judgement
		Before test	After test		Before test	After test				
At first cycle,in fully charged states	1	327.57	327.66	0.027	12.73	12.72	99.9	0	PASS	PASS
	2	328.50	328.63	0.040	12.70	12.68	99.8	0	PASS	
	3	328.28	328.50	0.067	12.75	12.74	99.9	0	PASS	
	4	328.24	328.46	0.067	12.74	12.73	99.9	0	PASS	
At first cycle,in fully discharged states	5	327.22	327.47	0.076				0	PASS	
	6	328.10	328.37	0.082				0	PASS	
	7	327.92	328.06	0.043				0	PASS	
	8	328.08	328.13	0.015				0	PASS	
After 50 cycles ending in fully charged states	9	328.41	328.44	0.009	12.77	12.77	100.0	0	PASS	
	10	328.49	328.59	0.030	12.79	12.79	100.0	0	PASS	
	11	327.35	327.40	0.015	12.79	12.78	99.9	0	PASS	
	12	327.89	327.96	0.021	12.80	12.79	99.9	0	PASS	
After 50 cycles ending in fully discharged states	13	327.17	327.40	0.070				0	PASS	
	14	327.83	327.99	0.049				0	PASS	
	15	328.67	328.66	0.003				0	PASS	
	16	328.18	328.19	0.003				0	PASS	

Notes: L-Leakage, V-Venting, D-Disassembly, R-Rupture, F-Fire,
0-No leakage, no venting, no disassembly, no rupture & no fire

UN Test Data (Model:3UR18650-2-T0627)

1.Test Item: Shock (T4)

2.Test Purpose: This test simulates possible impacts during transport.

3.Test Procedure:

Test cells and batteries shall be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery. Each cell or battery shall be subjected to a half-sine shock of pack acceleration of 150 g_n and pulse duration of 6 milliseconds. Each cell or battery shall be subjected to three shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.

However, large cells and large batteries shall be subjected to a half-sine shock of peak acceleration of 50 g_n and pulse duration of 11 milliseconds. Each cell or battery is subjected to three shocks in the positive direction followed by three shocks in the negative direction of each of three mutually perpendicular mounting positions of the cell for a total of 18 shocks.

SANYO Internal Procedure:

As above.

4.Test Requirements:

No mass loss(less than 0.1%),no leakage,no venting,no disassembly,no rupture and no fire,and the voltage retention is not less than 90%.

The requirement relating to voltage is not applicable to test batteries at fully discharged states.

5.Test Date: 2010/1/19

6.Test Data

Battery No.		Mass(g)		Mass loss (%) (=<0.1%)	Voltage(V)		Voltage Retention(%)(=>90%)	Other event	Result	Judgement
		Before test	After test		Before test	After test				
At first cycle,in fully charged states	1	327.66	327.69	0.009	12.72	12.72	100.0	0	PASS	PASS
	2	328.63	328.60	0.009	12.68	12.67	99.9	0	PASS	
	3	328.50	328.46	0.012	12.74	12.74	100.0	0	PASS	
	4	328.46	328.27	0.058	12.73	12.72	99.9	0	PASS	
At first cycle,in fully discharged states	5	327.47	327.60	0.040				0	PASS	
	6	328.37	328.32	0.015				0	PASS	
	7	328.06	328.03	0.009				0	PASS	
	8	328.13	328.10	0.009				0	PASS	
After 50 cycles ending in fully charged states	9	328.44	328.45	0.003	12.77	12.77	100.0	0	PASS	
	10	328.59	328.57	0.006	12.79	12.78	99.9	0	PASS	
	11	327.40	327.32	0.024	12.78	12.78	100.0	0	PASS	
	12	327.96	327.75	0.064	12.79	12.79	100.0	0	PASS	
After 50 cycles ending in fully discharged states	13	327.40	327.33	0.021				0	PASS	
	14	327.99	327.86	0.040				0	PASS	
	15	328.66	328.70	0.012				0	PASS	
	16	328.19	328.23	0.012				0	PASS	

Notes: L-Leakage, V-Venting, D-Disassembly, R-Rupture, F-Fire,
0-No leakage, no venting, no disassembly, no rupture & no fire

UN Test Data (Model:3UR18650-2-T0627)

1.Test Item: External short circuit (T5)

2.Test Purpose: This test simulates an external short circuit.

3.Test Procedure:

The cell or battery to be tested shall be temperature stabilized so that its external case temperature reaches 55±2℃ and then the cell or battery shall be subjected to a short circuit condition with a total external resistance of less than 0.1ohm at 55±2℃.This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to 55±2℃. The cell or battery must be observed for a further six hours for the test to be concluded.

SANYO Internal Procedure:

As above.

4.Test Requirements:

External temperature of test batteries does not exceed 170℃ and there is no disassembly,no rupture and no fire within six hours of this test.

5.Test Date: 2010/1/21-2010/1/22

6.Test Data

Battery No.		Maximum temperature (°C)	Other event	Result	Judgement
At first cycle,in fully charged states	1	54.9	0	PASS	PASS
	2	54.7	0	PASS	
	3	54.9	0	PASS	
	4	54.8	0	PASS	
At first cycle,in fully discharged states	5	54.9	0	PASS	
	6	54.7	0	PASS	
	7	54.9	0	PASS	
	8	54.7	0	PASS	
After 50 cycles ending in fully charged states	9	54.8	0	PASS	
	10	54.6	0	PASS	
	11	54.6	0	PASS	
	12	54.3	0	PASS	
After 50 cycles ending in fully discharged states	13	54.7	0	PASS	
	14	54.3	0	PASS	
	15	54.6	0	PASS	
	16	54.3	0	PASS	

Notes: D-Disassembly, R-Rupture, F-Fire, 0-No disassembly, no rupture & no fire

UN Test Data (Model:3UR18650-2-T0627)

1.Test Item: Impact (T6)

2.Test Purpose: This test simulates an impact.

3.Test Procedure:

The test sample cell or component cell is to be placed on a flat surface. A 15.8mm diameter bar is to be placed across the center of the sample. A 9.1kg mass is to be dropped from a height of 61±2.5cm onto the sample.
A cylindrical or prismatic cell is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8mm diameter curved surface lying across the centre of the test sample. A prismatic cell is also to be rotated 90 degrees around its longitudinal axis so that both the wide and narrow sides will be subjected to the impact. Each sample is to be subjected to only a single impact. Separate samples are to be used for each impact.
A coin or button cell is to be impacted with the flat surface of the sample parallel to the flat surface and the 15.8mm diameter curved surface lying across its center.

SANYO Internal Procedure:

As above.

4.Test Requirements:

External temperature of test batteries does not exceed 170°C and there is no disassembly and no fire within six hours of this test.

5.Test Date: 2009/10/21

6.Test Data:

Cell No.		Maximum Temperature(°C)	Other event	Result	Judgement
At first cycle, 50% charged states	1	120	0	PASS	PASS
	2	126	0	PASS	
	3	122	0	PASS	
	4	135	0	PASS	
	5	139	0	PASS	
	6		0		
	7		0		
	8		0		
	9		0		
	10		0		
After 50 cycles ending, in fully discharged states	11	43	0	PASS	
	12	40	0	PASS	
	13	45	0	PASS	
	14	42	0	PASS	
	15	41	0	PASS	
	16				
	17				
	18				
	19				
	20				

Notes: D-Disassembly, F-Fire, 0-No disassembly & no fire

UN Test Data (Model:3UR18650-2-T0627)

1.Test Item: Overcharge (T7)

2.Test Purpose: This test evaluates the ability of a rechargeable battery to withstand an overcharge condition.

3.Test Procedure:

The charge current shall be twice the manufacturer's recommended maximum continuous charge current.
The minimum voltage of the test shall be as follows:

(a) when the manufacturer's recommended charge voltage is not more than 18V,the minimum voltage of the test shall be the lesser of two times the maximum charge voltage of the battery or 22V.

(b) when the manufacturer's recommended charge voltage is more than 18V, the minimum voltage of the test shall be 1.2 times the maximum charge voltage.

Tests are to be conducted at ambient temperature. The duration of the test shall be 24 hours.

SANYO Internal Procedure:

Min.Charge Voltage:	22V
Charge Current:	3.6A

4.Test Requirements:

There is no disassembly and no fire within seven days of the test.

5.Test Date: 2010/1/12-2010/1/20

6.Test Data

Battery No.		Event	Result	Judgement
At first cycle in fully charged states	1	0	PASS	PASS
	2	0	PASS	
	3	0	PASS	
	4	0	PASS	
After 50 cycles ending in fully charged states	5	0	PASS	
	6	0	PASS	
	7	0	PASS	
	8	0	PASS	

Notes: D-Disassembly, F-Fire, 0-No disassembly & no fire

UN Test Data (Model:3UR18650-2-T0627)

1.Test Item: Drop Test

2.Test Purpose: This test simulates the drop of the packaging during transport.

3.Test Procedure:

Number of Test Samples (Per design type, Manufacturer) and Drop Orientation For other than flat drops the centre of gravity must be vertically over the point of impact. Where more than one orientation is possible for a given drops, the orientation most likely to result in failure of the packaging must be used.

Packaging	Number of test samples	Drop orientation
Boxes of natural wood Plywood boxes Reconstituted wood boxes Fibreboard boxes Plastic boxes Steel or aluminum boxes Composite Packagings which are in the shape of a box.	Five (one for each drop)	First drop: flat on the bottom Second drop: flat on the top Third drop: flat on the long side Fourth drop: flat on the short side Fifth drop: on a corner

SANYO Internal Procedure:

Packaging: Fiberboard boxes. Number of test samples: Five(one for each drop). It may do the drop of five orientations with one sample if the packing does not have the big damage.

Drop orientation: As above.

4.Test Requirements:

A Package passes the test if it meets the following criteria:

Each package is capable of withstanding a 1.2 meter drop test in any orientation without damage to cells or batteries contained therein, without shifting of the contents so as to allow battery to battery (or cell to cell) contact and without release of contents.

5.Test Date: 2010/1/26

6.Test Data: PASS(Drop height 1.2m)

6-1. No any package crack
6-2. No any cell damege and battery damage.
6-3. No any out side release of contents from shipping box
6-4. No any contact between battery and battery, cell and cell.

Packaging size:
539*334*118mm
Packaging weight (before):
7.05kg
Packaging weight (after):
7.05kg